half-an-inch. Iron girder bridges exist on every railway in the kingdom; and he considers that up to a span between 35 and 40 feet, a flat cast-iron girder, of strength calculated to the usual formula, affords security as a railway bridge. With respect to the compound girders, similar to those over the Dee at Chester, there are six bridges, with girders in three castings, bolted together at the flanges, clipped underneath, and strengthened by massive wrought-iron rods, forming an inverted truss. There are two over the Trent and Mersey Canal—span, 54 feet 3 inches; one over the turnpike-road, 57 feet; one over the Coventry Canal, 60 feet; one over the Oxford Canal, 44 feet; and one over the River Tame, 70 feet span. The latter bridge has had a double row of piles driven in the bed of the river under each of the joining flanges of the girders; these piles are connected at the heads by cup sills, extending under the girders, and the interval between them and the girders is made good with wedges—thus dividing each span into three spans, and covered by a girder calculated equal to three times the span: he has no doubt, therefore, of the strength and efficiency of this bridge. The other five range between 50 and 60 feet; and assuming that these compound girders, including their tension rods, are only half more in strength than the calculated beam, they fully come up to the proportions hitherto considered safe by eminent engineers. In testing these girders, there was but a deflection of three-quarters of an inch on a span of 60 feet. He remarks,—"In the same manner that I consider experience to have proved the sufficiency of a simple girder up to 40 feet, I consider it has also proved the sufficiency of the compound girders up to 70 feet."——Mr. Gibbons, of Corbyn's Hall Iron-Works, has patented a new method of trussing cast-iron girders, in which the rigid trusses heretofore employed are abandoned, and elastic ones substituted. The *Mining Journal* attempts to describe it, by supposing a girder of considerable length, formed of three sections, bolted together, through flanges at the end of each, in the usual manner. Mr. Gibbons now introduces beneath the centre section a powerful spring, made exactly similar to the bearing springs of railway carriages, with the convex side abutting on the girder; and wrought-iron truss-rods are fastened to each end of this spring, and bolted up tight to flanges, cast at the extreme ends of the two outer sections of the girder. Where the girders are of considerable width, a number of springs may be used, ranged side by side; or smaller springs may be used, and placed two together, with their concave faces inwards, one under each joint of the sections of girder, and one in the centre, trussed up tight by suspension rods.

THE GOODWIN SANDS ONCE MORE!

'He will surely be mad who makes another attempt to raise a beacon-light on the Goodwin Sands,' was the ejaculation of a despairing cotemporary on the failure there of the late attempt to 'rule the waves,' and 'build upon the sand,'—two formidable and daring enough, if not foolhardy, projects, as, in an unqualified sense, they certainly would have been: but in truth the late attempt at the Goodwin Sands was not an attempt to do the one of these mighty deeds, by aid of the other, at all, but a bold and ingenious endeavour to rule the shifting sands themselves, by piercing them through and through, and nailing them down, as it were, to the solid rock below, even though at a depth of three-and-thirty feet beneath their shifting surface. Such was and is the hopeful scheme of which we, some weeks since, gave to the readers of THE BUILDER our own ideas, along with particulars furnished by one who had carefully examined the details; and we are glad to perceive that our remarks have already been suggestive, and that a modification of Dr. Potts's attempt to pierce the sands to the bottom, in connection with other and engineering means of taking more or less full advantage of the anticipated success of such an attempt, on what may be called a great scale or compass, to pierce, by pneumatic tubes, to the bottom of these sands, has been already suggested, with the view of once more even daring, with us, to renew the 'mad' attempt to strip this too long celebrated terror to our seafaring fellow-men of all its horrors.

In the *Mining Journal* of Saturday last, Mr. George Shepherd, C.E., presents the details, with plans, of such a suggestion. He proposes "to construct a wrought-iron cylinder of say three-eighths-of-an-inch boiler-plate-iron, of 30 feet diameter, which would give a sufficient base for a lighthouse of 120 feet above high-water mark. Such a light would be seen at a suitable distance. The cylinder should be made into sections of 4 feet in length, and should be fitted up on shore with the greatest care. A stage could be made on piles, driven into the sand, and the whole well braced together. Having adjusted the preliminary arrangements, 16 feet of the cylinder could be put together, suspended between four lighters; and then, by the aid of a small steamer, could be towed into its intended position, and there lowered into the sands. Having fixed and secured the first portion of the cylinder to low-water mark, the remaining sections could be floated off in the same manner. The joints being previously prepared, each section could be screwed together, and sunk to the required depth, in a short time. In case it was found that the cylinder had not sunk to the required depth, I should resort to Dr. Potts's atmospheric pile-driving system, by which means the cylinder could be forced down to the required depth. The next plan of operation would be to drive the external piles [in a circle, surrounding the great central pile, tube, or cylinder], also by Dr. Potts's system, the whole well braced together. When the pile-driving is completed, the sand between the cylinder and the piles should be taken out as deep as possible, with the bag and spoon apparatus; and the space thus excavated should be immediately refilled with the best concrete, which would entirely protect the foundation against every storm. The cylinder being so far perfectly secured, a few ship pumps could be fixed inside to pump out the water; and, in order then to secure the cylinder against the external pressure, a [temporary] process of timbering should be resorted to.

After having pumped out the water, and well secured the cylinder against the external pressure, the sand inside the cylinder could be taken out, and the same process of timbering repeated every 5 feet, until the whole of the sand is excavated to the chalk formation. The sand being excavated, the concrete foundation for the lighthouse should be put in without delay. The concrete being set in one mass, the stone work could be commenced; and, as the stonework rises inside the cylinder, the timber could be taken out. The stonework should be of the strongest construction, and every block well bound together.

All works of this nature should be commenced in the early part of the spring. While the apparatus lies in readiness on shore, the cylinder could be quickly sunk into its position, and perfectly secured by piles and concrete in a few months. In case of storm, or bad weather, it would be only requisite to let the water into the cylinder, to counterbalance the external pressure of the waves, and which could be easily removed, when the storm had abated. This plan of effecting a firm foundation for lighthouses is not only applicable to the Goodwin Sands, but can be extended to all bars of rivers, and other places where a light is required to warn the mariner of danger."

BUILDERS' ASSOCIATION AT LIVERPOOL.—In consequence of what has been conceived to be the needlessly arbitrary and costly regulations of the local sanitary bill, and the requirements of the council's committee of health, supported as they in general are by the magistrates even in cases where appeal, it is thought, would lead to a reversal of their decisions, an association has been established, according to a correspondent of the *Albion*, not with any adverse feeling towards those sanitary measures which must rather benefit the property of house proprietors and builders in general than the contrary, but simply for mutual protection against oppressive measures and decisions by a general defrayment of the costs of appeal, &c., in cases which affect the interests of the body at large and not of individuals merely.

SOCIETY OF ARTS.

AT a meeting on the 17th ult. a communication was read by Mr. Briant, "On his plan for overcoming the difficulties of a break of gauge, and of uniting the broad and narrow gauge railways." Mr. Briant commenced his paper by pointing out the difficulties which had arisen from the adoption of the two gauges in this country, and the objections which have been urged against the various plans, viz., the telescopic axles for the wheels, the shifting from the carriages of one gauge to that of another, laying down double lines of rails, &c. He then proceeded to describe his own plan, which is as follows:—At the point of junction of the two gauges a platform is to be fixed in the centre of the rails, the carriages are then to be placed upon wheels, the two ends of the axles of which are to be made as male screws; on the centre of the axle a pinion wheel is to be fixed, and under it, attached to the frame of the carriage, a lever, upon the upper side of which is a rack, and at the lower end an anti-friction roller. The naves of the wheels are to extend under the carriage in the form of a female screw, to receive the axles. By this arrangement, while the train is travelling on the narrow gauge the wheels would be screwed up to the required width, the racked lever hanging loosely under the pinion wheel, and the axle would turn with the wheels—but when the train reached the point of junction the lever would be caught up by the platform (which is to be forty yards long), and with it the rack. The axle would thus be prevented from turning, by the pinion wheel and rack; and the wheels, from the weight of carriage passengers, luggage, &c., pressing upon them, would immediately begin to unwind the screw, which, by the time the carriage has reached the other end of the platform, will have extended the axle to the required width: the lever would drop and free the pinion-wheel, and the axle would then turn with the wheels as before. The wheels are kept in their position when unwound by coupling rods: in backing the train the screw is prevented from acting by means of a stop fixed to the carriage, and blocking the axle. A working model was exhibited.—The second communication read was by Mr. D. J. Hoare, "On a railway telegraph and alarum to be used as a means of communicating between the guard and driver of railway carriages." The plan proposed is that a screw of rods should be passed through the carriages of a train and united at their extremities by a telescope-joint, so as to allow of extension and contraction. The rods being made with a universal joint, admit of a rotary motion—the only motion which a railway train has not. At the end of the rod, on the guard's carriage, is a crank, which, when the rod is turned, comes in contact with a hammer, and causes it to strike a bell. A signal is then to be raised, indicating the carriage from which the signal is made. The guard will then immediately ascertain whether it is necessary that the train should be stopped, (?) and if so, by turning the rod in the reverse direction to what the person signalling had done, will ring another bell at the driver's end of the train, or sound the whistle of the engine.

NEW GAS ENGINE.—An engine, on a new principle, has been invented by a Mr. Perry, of Herkimer, and is now in operation at the store of Mr. Samuel Perry, in Front-street, near Whitehall, and evinces an astonishing power in proportion to the minute quantity of material from which the power is produced. The machinery consists, in part, of a cylinder, piston, pitman, flywheel, and governor; in this respect similar to a steam engine. A small quantity of spirits of turpentine is kept in a warm state, and the vapour arising therefrom is mixed with fifty times its volume of atmospheric air. A small quantity of this hydrogenated air is drawn into the cylinder and ignited by a movement of the machinery, producing a slight explosion, whereby the remaining air—at least nine-tenths of the whole—becomes so heated that it drives forward the piston with great force by its expansion. This engine is said to be capable of working ten-horse power; and it is intended to substitute resin instead of turpentine, which will reduce the expense of feeding it to about 50 cents per day.—*New York Journal.*